Discussion Paper Series – CRC TR 224

Discussion Paper No. 471
Project A 05

Racial Representation Among Academics and Students' Academic and Labor Market Outcomes

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November 2023

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Support by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) through CRC TR 224 is gratefully acknowledged.

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September 15, 2023

Abstract

We study the impact of racial representation among academic staff on university students' academic and labor market outcomes. We use administrative data on the universe of staff and students at all UK universities, linked to representative survey data on students' post-graduation outcomes, exploiting idiosyncratic variation (conditional on a rich set of fixed effects and observable student, staff, and university-department level characteristics) in the proportion of racial minority academic staff to whom students are exposed. We find that own-race representation benefits the academic outcomes of South Asian students but not Black students, and no beneficial impacts of own-race representation on the labor market outcomes of either group. However, we do find that same race representation among academic staff significantly increases progression of Black and South Asian students to graduate study, suggesting that there may be benefits of same-race representation operating through provision of role models or domain-specific advice and guidance.

JEL classifications: I23, I26, J15, J24
Keywords: Minorities, Representation, Returns to Education, Labor Market Outcomes

*We are grateful for the comments received from Arun Advani, Thomas Cornelissen, Emilia Del Bono, Margaret Leighton, and Ian Walker. Support by Economic and Social Research Council (ESRC) through grants ES/S012486/1, ES/M008622/1 and ES/P00072X/1 and by the German Research Foundation (DFG) through CRC TR 224 (Project A05) is gratefully acknowledged. This research uses data from HESA Student Records, Staff Records and Destination of Leavers from Higher Education Survey which are available under license for specified research projects. Access to the data must be restricted to named researchers, and outputs must comply with certain statistical disclosure controls. We will assist those who would like to obtain the data for replication purposes. Corresponding author: Sonkurt Sen, Department of Economics & Institute for Applied Microeconomics, University of Bonn. sonkurt.sen@uni-bonn.de.

1 Introduction

Though longstanding, racial inequalities in educational and labor market outcomes have gained prominence through recent events. Those with a university degree are not insulated from these inequalities (Arcidiacono & Koedel, 2014; Meschede *et al.*, 2017; Zwysen & Longhi, 2018; Lessard-Phillips *et al.*, 2018), or the impacts of these shocks (Blundell *et al.*, 2022; Cech & Hiltner, 2022). For example, among 2020/21 graduates from UK universities, White students were twice as likely to obtain a first class honors degree as Black students (39.4% versus 20.0%; HESA (2022)). For the same graduating cohort, statistics shows that White graduates were 6 percentage points more likely to be in full-time employment than Black and Asian graduates (63% versus 57% and 57% respectively) 15 months after graduation (HESA, 2023). This suggests that there are inequalities in human capital accumulation at university by ethnicity, that restrict graduates' access to the careers in which they will be most productive. This alone will hinder economic growth Hseih *et al.* (2019) as well as innovation and knowledge creation (Parrotta *et al.*, 2014; Freeman & Huang, 2015). This also relates to progression into graduate study where both future composition of university teaching staff and high-skilled workforce who work in R&D and create knowledge.

These differences has led to a focus on how educational institutions can change in order to mitigate racial inequalities. Affirmative action policies have been much-studied in relation to inequalities in *access* to Higher Education (Arcidiacono, 2005; Hinrichs, 2012, 2014; Arcidiacono *et al.*, 2015, 2016; Sen, 2023), but for studying later outcomes, it is difficult to disentangle the effects of selection into different institutions for individuals from the effects of the changing co-ethnic composition of peers. Declared initiatives to "decolonize" Higher Education (HE) aim to improve ethnic minority students' sense of belonging and representation in the curriculum, and remove structural discrimination and racism. There is as-yet no quantitative evidence on the impacts of such schemes on ethnic minority students' outcomes, though qualitative evidence suggests the predominantly White ethnicity of university staff and leadership is likely to present a barrier to their success (Hall *et al.*, 2021; Sakata *et al.*, 2023). Between 2012 and 2017, just 13% of university academic staff in the UK were non-White, and just 2% per Black, compared with 21% and 5% of students. A concrete step, which universities would have the agency to implement over time, could therefore be to increase the representation of Black and racial minority academics among university staff. Previous literature has indeed shown that racial representation in the classroom

has positive effects on students' academic outcomes in community college (Fairlie *et al.*, 2014) and university (Lusher *et al.*, 2018; Oliver *et al.*, 2021).

In this paper, we identify the impact of racial composition of academic staff in university departments on the academic and post-graduation outcomes of students from different racial groups. We do this using Higher Education Statistics Agency (HESA) administrative data on the universe of fi9ve cohorts of undergraduate students at UK universities and the academic staff in the departments and institutions of study, linked with the HESA Destination of Leavers from Higher Education (DLHE) survey of graduates' outcomes six months after leaving university. Our administrative HESA data includes extensive information about the demographic characteristics of the universe of students and staff at UK universities between 2011 and 2017. The student records also document their academic progression through university and previous educational qualifications, and the staff records their contract type, job grade, salary bracket, tenure in current role, and teaching qualifications. Our survey data comes from HESA's nationally-representative DLHE survey which surveys graduates 6-months after graduation and includes information about the labor market and further study outcomes of the graduates. All three of our datasets are linkable and we exploit this linkage to understand the effect of representation among academics on student (and graduate) outcomes. We derive the proportion of academic staff from each racial group within each university department[1] as our measure of students' exposure to racial minority academics.

Our identification strategy is to exploit idiosyncratic variation in exposure to racial minority academics across cohorts, subjects, and universities. We may be concerned that racial representation and education and labor market outcomes may be moving in the same direction over time; or that racial representation is systematically correlated with aspects of university, staff, or student "quality" or selectivity. We therefore condition on university, subject, cohort, and student choice-set fixed effects, a rich set of student demographic characteristics, educational background variables, and other staff characteristics. Our identifying assumption is then that the residual variation in students' exposure to racial minority staff is quasi-random. It is reasonable to expect that this is true. The subject areas that students can apply for are determined by subjects and qualifications chosen at least two years earlier. Universities to which prospective students can be admitted are determined substantially by predicted grades at least one year previously. Students

[1]We focus on White, Black, and South Asian racial groups of both students and staff. We group the remainder, which includes those of Chinese, Arab and several mixed backgrounds into "Other".

apply for universities in the preceding academic year before entry, before they can observe changes to the racial composition of staff to those that they will be exposed to throughout their degree. Finally, having applied, students cannot control which courses they receive offers from, nor know in advance that they will achieve the required grades to be *accepted* on the course.

We support this assumption by showing that students' demographic characteristics do not predict their exposure to minority academics. Additionally, we follow Fairlie *et al.* (2014) and show that White-minority gaps in demographic characteristics and entry test scores cannot be predicted by the proportion of minority academics in a given department. This provides evidence that there is no differential selection into such environments across students of different races.

We initially find no significant effect of racial minority staff on the degree class or dropout probability of racial minority students. Breaking these racial groups, of both staff and students, down into Black, South Asian and Other racial minority group, we find that own-race representation benefits the academic outcomes of South Asian students but not Black students, and no beneficial (and some detrimental) impacts of own-race representation on the employment outcomes of both groups. However, we do find that own-race representation among academic staff significantly increases progression of Black and South Asian students to graduate study. This meets a necessary condition for further increases in racial minority (especially Black) representation among academic staff and in the R&D sector.[2] This can improve innovation and the quality of academic work as Parrotta *et al.* (2014) show that racial diversity increases firms' innovation while Freeman & Huang (2015) show that racially diverse co-authorship leads to better publication and knowledge creating in academia. We also show evidence that White students benefit from exposure to racial minority staff, significantly in terms of first class degree, graduate-level or high-status occupation employment, and are only concretely harmed by minority academic staff leading to a reduction in their probability of progressing to graduate study.

Our study closely relates and contributes to a growing literature on the effect of representation in the classroom and student outcomes. There is now a portfolio of evidence from the HE setting, from Bettinger & Long (2005), Carrell *et al.* (2010), Canaan & Mouganie (2021) and others that female representation among STEM (Science, Technology, Engineering and Maths) instructors increases female students' retention and progression in STEM subjects. With respect to race and

[2]We recognize there may also be differential barriers to completion and career progression in postgraduate research and academia, that the UK's national body of research councils is investing in several initiatives to mitigate https://www.ukri.org/what-we-offer/browse-our-areas-of-investment-and-support/widening-participation-in-postgraduate-research/

ethnicity, earlier studies mainly focus on representation in primary school classrooms. Dee (2004, 2005) and Winters *et al.* (2013) find that students taught by teachers from their own gender and racial group achieve higher grades. Similarly, Holt & Gershenson (2019) find positive results for suspension and absenteeism, Lindsay & Hart (2017) for exclusion, Ehrenberg *et al.* (1995) and Gershenson *et al.* (2016) for teacher expectations and Egalite & Kisida (2018) for perception and attitudes of students. Fairlie *et al.* (2014) and Lusher *et al.* (2018) study community college and university students respectively, and both find significant gains in performance and progression to ethnic minority students from same-ethnicity instructors and teaching assistants.

Yet, these papers focus on within-classroom interactions, study short or medium-term educational outcomes, and focus on either one institution or small group of institutions. One contribution of this paper is to capture the impact of same-race representation on outcomes both within and beyond the classroom, identifying the persistence (if any) both *over time*, beyond the immediate period of exposure, and *across environments*. It shows whether higher representation in the education setting changes behaviors or improve human capital in ways that benefit racial minority individuals in the job market and access to postgraduate study and research, beyond, for example, direct effects driven by mechanisms such as biases in teacher grading (Dee, 2005). Breda *et al.* (2023) have shown that brief exposure to female role models in secondary education increases female progression into STEM at college and university. Similarly, it seems reasonable to expect that same-race staff may act as role models or sources of information and so continue to influence racial minority students' aspirations, decisions and outcomes beyond university. While we are unable to observe such interactions directly, we explore the likely mechanisms at work through careful differentiation of our dependent variables.

A second contribution to the literature is to external validity, by studying these impacts using data on the universe of students in the UK HE institutions. Previous papers, whether at the university or pre-university level, focus on either one institution or small group of institutions. It is likely that students studying at different universities or subjects or those studying in different years may have different effects when they are exposed to minority academics. This is especially true for labor market outcomes where graduates from more selective universities might have better labor market outcomes no matter the degree of exposure to minority academics. By using data from the universe of students and staff at the universities in the UK, we can capture the average impact across institutions of varying selectivity and subjects of study with varying labor market

prospects, and we can show heterogeneity of impacts across subjects areas grouped along these lines.

The rest of the paper is organized as follows: Section 2 describes the institutional framework, Section 3 presents data and shows the descriptive statistics, Section 4 explains empirical strategy, Section 5 shows and discusses results, Section 6 presents the robustness check and Section 7 concludes.

2 Institutional Framework

Students aspiring to attend university in the UK study a broad curriculum to age 16. At this point, they must obtain sufficiently high performance in 'Level 2' qualifications to progress into 'Sixth Form' education for an additional 2 years. This can entail an 'academic track' usually comprising 'A Levels', or 'Highers' in Scotland, taught in schools or Sixth Form Colleges; or a vocational track, usually comprising 'BTECs'[3], predominantly taught in Further Education Colleges. Both options are already very specialized, with A Levels typically taken in 3 subjects, and BTECs often in a single subject. These are all 'Level 3' qualifications, and the University and College Admissions Service (UCAS) publishes 'tariffs' associated with the size of different qualifications and grades achieved, in order to judge 'equivalent' qualifications.[4]

Unlike the US where students apply to universities and declare their majors later on, in the UK students apply to study a specific "degree program", that is an institution-and-subject combination. Many degree programs have specific pre-requisites. For example, studying Physics at university invariably requires an A Level or Advanced Higher in Mathematics; while until 2019 the "Russell Group" of selective universities published a list of "Facilitating Subjects", of which these institutions would expect at least one A Level or Advanced Higher. [5] Universities also differ in their selectivity in terms of grades (or UCAS tariff scores) required for admission. Students apply for university during the preceding academic year to entry, submitting achieved grades in age-16/level 2 qualifications and predicted grades for age-18/level 3 qualifications. In the period we study, the latter were substantially determined by achieved grades in "AS Levels" (at the time

[3]BTEC or Business and Technology exams involve hands-on training on a vocational subject. These include but not limited to Accountancy, Business Management, Childcare, etc.

[4]For example, a 'BTEC National Extended Diploma' is worth the same as 3 A Levels.

[5]See e.g. https://www.theguardian.com/education/2019/may/23/russell-group-scraps-preferred-a-levels-list-after-arts-subjects-hit. Facilitating subjects have been replaced by an online tool explaining what subjects are required in post-16 study in order to "keep options open" (see https://www.informedchoices.ac.uk/).

the first half of an A-Level), and in that BTEC coursework already completed. This means that students' choice set of programs to which they can realistically be admitted, is already somewhat narrowed at time of application. Students apply for up to five programs, must choose their first and second choice from any offers they receive, and are admitted to the higher-ranked of these for which they achieve the required grades. Students may make *application* and *rank-ordering* decisions with reference to observed presence of racial minority academic staff in the relevant university department. However in this framework there is no opportunity to base these decisions on *changes* in prevalence of racial minority staff that they will face compared with earlier cohorts, which would be the threat to identification in our case.

Degree programs consist of modules (courses or classes) at Level 4 (first-year), Level 5 (second year) and Level 6 (third year) of the national qualifications framework, a minimum number of each of which students must pass to be awarded a degree. Typically the average mark from second and third year determines the degree class that students graduate with. This modular structure means that some degree programs cover multiple subject areas and are taught by multiple departments, but because second and year third year modules will themselves have first and second-year modules as prerequisites, there is very limited scope to switch 'major' or degree program, except by dropping 'minor' subjects, or withdrawing and starting again. This ensures that students cannot choose to switch programs to study in departments with a higher or lower proportion of racial minority academics. Students can apply to a program with components from two different subjects.[6] For example, a BSc in Economics *and* Politics is similar to double majoring in Economics and Politics but rather than taking all the required courses in two subjects, students take a subset of courses from both subjects. Similarly, students can choose to study for a degree program that has a component from a different subject. BSc in Economics *with* Mathematics would be similar to majoring in Economics and minoring in Mathematics. Another difference in the UK higher education is that students do not have a chance to study for a double major or a minor from any department that they would like. These programs are pre-determined by the university and universities generally allow students to study for two programs in this way only if the subjects are related to each other.[7] In this paper, we define our treatment variable, exposure to racial minority staff, based on the department administering the student's degree. This is because alternative

[6] 12% of the students in our data study for a course with an additional subject.

[7] This ensures that once at the university, students who might be actively seeking minority academics cannot combine another program where there are higher proportion of minority academics with their program.

definitions, such as a weighted average of the departments administering the modules the student finally takes, may be endogenous to staff race, given that the characteristics of teaching staff for specific modules are more readily observable to students once present at university, and just one academic term ahead.

Interactions between staff and students include "Lectures" which are usually 2 hours a week and are taught by the main instructor (module director); and "Classes" which are usually 1 hour per week and are taught by either instructors or by teaching assistants. These classes can take many forms such as problem sessions, discussion sessions, labs or seminars depending on the content of the course. Students may also have additional support classes which are generally voluntary and targeted at students who are falling behind or who have less prior knowledge in the subject studied. Classes are more interactive than lectures, and tend to involve fewer students in a single classroom. Delavande *et al.* (2023) show that the average weekly attendance for a student is around 10 hours. Additionally, academics hold office hours where students can interact with their instructors.

3 Data and Descriptive Statistics

3.1 Data

For this paper, we link three datasets. The first is the Higher Education Statistics Agency (HESA)'s Student Records. HESA is the regulatory body in the UK that collects student data from all the degree-awarding Higher Education Institutions ("universities" henceforth). HESA Student Records is an administrative dataset that includes information about all students regardless of their domicile, nationality or the program of study. The records include detailed information about the students' progress over time and their graduation outcomes as well as students' personal characteristics and previous qualifications and grades.

The second source is the HESA's Destinations of Leavers from Higher Education (DLHE) survey. DLHE is a representative graduate survey that is sent to all graduates from UK universities, approximately 6 months after completion. It collects data about graduates' education or labor market activity on a "snapshot day". This includes, for those in employment, the type of job and contract they have, whether a degree was required to obtain the job, and the Standard Occupational Classification of the job.

Our last data source is the HESA's Staff Records. Similar to Student Records, HESA collects

data from all UK universities about their staff. This dataset includes information about the staff's background, qualifications, employment, salary and years of service in their current role. Using this dataset, we calculate department × university × academic year level averages for racial composition of staff, plus other department level characteristics such as proportion of female academics, proportion of academics at the level of Reader and above, proportion of academics earning a high salary, etc.[8]

We link students' administrative records to their responses to the DLHE, and to staff characteristics of the department administering their degree program. The data that we derive after these linkages includes 114 universities and 45 subjects (see Appendix Table B2). We drop two highly-selective universities and two highly-selective subject fields for which we expect the effects to be atypical. We drop the universities of Oxford and Cambridge where interactions are more likely to be concentrated within a "College" than academic department. We also exclude students studying for a degree in Medicine and Dentistry, where student numbers are controlled by the Office for Students (HE regulator in the UK) to ensure that these programs are not overcrowded. As these programs have limited number of students that they can admit, they are more likely to be highly selective. Students studying these subjects also have different career paths once they graduate from these programs which might affect the interpretation and external validity of our results on the post-university outcomes. We also restrict the sample to students without a disability as selection into HE for students with a disability is markedly different across ethnic groups.

3.2 Descriptive Statistics

In this section we document (i) the variation in the proportion of racial minority staff that students are exposed to; and key differences in (ii) the predetermined characteristics and (iii) the outcomes of students and graduates from different racial groups.

Figure 1 and Figure 2 show the proportion of academic staff from all racial minorities, then Black, South Asian and Other racial minorities, across groups defined by department-university-year, first unweighted and then weighted by the student numbers. The median proportion of minority academics is around 10%, but there is variation between zero and 80%. Similarly, while median prevalence of staff from each distinct racial group is low, there still exists substantial

[8]The level of Reader is similar to Associate Professor in US and other countries. We consider academics to have high salaries if they are earning over £60k a year. Departments are referred to as "cost centers" in HESA records.

variation in each case. Figure 3 shows very small increases over time in the share of racial minority academics in the university sector as a whole. However, what matters for this paper is the residual variation, across the department-university-year groups plotted in Figure 1 and Figure 2, after controlling for fixed effects and observable characteristics.. We document this in section 4.1.

In Table 1, we present the control variables and outcomes of interest, first for all students and then by students' race.[9] This shows that White students are more advantaged than racial minority students in terms of socio-economic background, whether defined by parental occupation (70% of White, 62% of Black, 47% of South Asian have a parent in a high SES occupation) or private schooling (10% of White, 3% of Black, 7% of South Asian). They are also advantaged in terms of prior educational performance (White students' average Tariff score is equivalent to over one grade in an A-Level higher than Black students', and half a grade higher than South Asians) and educational track (10% of White students arrive with the vocation BTEC qualifications versus 27% of Black students and 16% of South Asian).[10] These differences reflect a combination of the overall composition of the school population (higher attainment and SES among White), and conditional on this, gaps in access to HE by race for the cohorts we study (higher for racial minorities, of whom those with the highest participation are the least positively selected on attainment and SES; Crawford & Greaves (2019), Richardson *et al.* (2020)). We control for these predetermined characteristics in our analyses, since we expect all to have an important impact on academic and labor market outcomes (Del Bono & Holford, 2018).

The lower panels of Table 1 show that White students achieve better outcomes at university and in the labor market after graduation. For example, 23% of White students achieve a first class honors degree[11], versus 10% and 17% of Black and South Asian students. This may partly be driven by differences in personal characteristics and/or entry test scores, which we will control for. The situation is similar in post-graduation, although the differences are lower. While we do not see much difference in terms of being employed between White and Black students, the difference between White and South Asian students is 5ppt, or 7% of the mean. On the other hand, when we look at the differences between White and minority graduates' job characteristics, the difference

[9] In accordance with the data license from HESA, all sample sizes are rounded to the nearest 5. For descriptive statistics by the cluster and racial minority shares of the universities, see Appendix Table A1 and Appendix Table A2.

[10] While the UK HE entry system uses letter grades, we quantify these and present them in the table. We use the conversion table from the Universities and Colleges Admissions Service which is UK's university admissions service provider and cap the grades at A. We use the top three grades from A Level (or equivalent) exams as the universities normally consider the top three grades from these exams. As we cap the grades at A and use top three grades, our tariff measure is between 0 and 144. The difference in points between two letters (A vs B or B vs C) is 8 tariff points.

[11] First class honors degree is given to those who achieve an average mark of 70 or higher.

in holding a graduate level or high SOC job[12] between White and Black graduates is 5ppt each, or 13% and 8% of the mean, respectively. Interestingly, we do not find much difference between White and South Asian students in job characteristics, conditional on employment, but this may reflect the difference in selection. When it comes to likelihood of studying for any degree or a graduate degree, we see that proportions are similar for White and minority students.

4 Empirical Strategy

In order to study how exposure to minority academics affects students' academic and labor market outcomes we estimate the following model. We use Ordinary Least Squares method despite the dependent variables being binary, since no proportions are close to zero or one:

$$Y_{isjt} = \beta_1 \mathbf{X}_i + \beta_2 \Gamma_i + \beta_3 PMin_{sjt} + \beta_4 \Gamma_i \times PMin_{sjt} + \beta_5 \mathbf{D}_{sjt} + \beta_6 \delta_s + \beta_7 \theta_j + \beta_8 \tau_t + \beta_9 \lambda_g \times \psi_c + \beta_{10} \mathbf{Q}_i + \epsilon_{isjt} \quad (1)$$

where Y_{isjt} is the outcome of individual i, studying subject s, in university j, and cohort (time) t. The treatment variable $PMin$ is either (i) the proportion of minority academics or (ii) a vector containing the proportion of Black academics, proportion of South Asian academics and proportion of Other minority racial academics, that the student is exposed to in their subject, university and cohort of study. Where the outcome is 'dropout' we measure $PMin$ for the student's first year of study; otherwise we measure this using the student's scheduled final year of study. We restrict the denominator for these minority-staff shares to staff that do not only hold an administrative role (ie. excludes administrative only role, head of department, dean, etc.).

$\mathbf{X}$ is a vector of student characteristics that includes gender, socio-economic status, mature student status, and a dummy for coming from an area with low HE attainment. Γ is a student race dummy. This is either i) White and minority or ii) White, Black, South Asian and Other. $\mathbf{D}$ is a vector of department level characteristics: Proportion of female academics, proportion of academics that are Reader of above, proportion of academics tenured, proportion of student facing academics, academics' average years of service in a given university, and proportion of academics

[12] We define graduate jobs as a job where subject or level of study is important or qualification is needed. We classify High SOC jobs as those in managerial, professional or intermediate occupations.

earning a high salary[13]. **Q** is a vector of pre-university qualification subjects.[14]

We control for subject fixed effects (δ_s), university fixed effects (θ_j) and cohort fixed effects (τ_t). These remove the impact of any correlations between share of minority academics and additive impacts of students' subject, university or cohort on their potential outcomes. These could act, for example, through subject or institution-specific grading standards or reputations with graduate employers, the changing overall health of the economy, or other unobservable student and staff characteristics. These fixed-effects would not however capture any *interactive* effects, such as if there is a bigger difference in the returns to taking a Humanities degree in more versus less competitive universities, than the return to a STEM degree between these institutions. Including university $\times$ subject fixed effects could address this, but this leaves little residual variation to identify the effect of minority academic staff representation on student outcomes. Instead, we address this form of unobserved heterogeneity by including subject *group* fixed effects, λ_g, interacted with university group ("cluster") fixed effects, ψ_c. Specifically, we create 5 subject groups: Allied to Health, STEM, Social Sciences (including Business), Humanities and Others; and use 3 university "cluster" groups, as defined in Boliver (2015) using several factors such as their selectivity, research output, teaching performance etc.[15], and listed in Table B1.

Interacting these creates 15 dummy terms, which we label "choice set" fixed effects. We assign these to students using their realized outcomes: the subject of the degree program and the university attended. For identification, our assumption is that these capture any differential returns to subject or differences by subject in unobservable heterogeneity in staff and student characteristics across institutions. The features of the UK university admission system ensure that using ex-post outcomes still gives an intuitive interpretation of these fixed-effects as representing students' ex-ante choice set. As previously discussed, students typically study a maximum of only 3 subjects in the year prior to coming to university. This circumscribes the subject areas for which they can realistically be admitted to a degree program. Meanwhile, applications are based on predicted grades and admissions on realized grades in these qualifications, the criteria for which vary chiefly across university clusters. This circumscribes the institutions to which students can realistically be admitted on a degree program, or (where predicted grades far exceed standard entry requirements)

[13] Reader is similar to Associate Professor in American system. High earning academics are defined as those earning over £60 per yar

[14] Vector of qualification subjects includes dummies for having taken (Further) Mathematics, English Literature, Biology, Chemistry, Physics, Geography, History and Modern Languages.

[15] Boliver (2015) define 4 clusters, but we exclude the "elite" cluster containing Oxford and Cambridge. as their teaching method is based on tutorials, small number of students in a tutorial, leading more interactions between the instructor and the students.

those to which a student would apply. Conditional on other covariates, students with the same choice set are likely to have more similar potential outcomes than students with different choice sets, and less scope for these potential outcomes to be correlated with the share of racial minority staff they are exposed to.

We, then, assume that students' exposure to minority academics is random conditional on their university cluster - subject group choice set and the additional fixed-effects and controls. With this assumption the coefficient β_3 in equation 1 identifies the impact of exposure to minority academics on White students' academic and labor market outcomes; and β_4 the differential effect of minority academics on minority students, relative to White students.

To give a concrete example, consider two identical students from different cohorts. They faced the same choice set, and attended the same university to study the same subject. Over time the racial composition of academic staff teaching that subject at that university changed; Student 1 faced 10% minority staff, and student 2 faced 12% minority staff; while nationally the proportion of racial minority staff remained static. That 2 percentage point increase in minority exposure is the variation we use to identify the effect of minority staff on these students' outcomes.

To give a second example, consider Universities A and B, that have a similar selectivity and research output so are in the same cluster and choice set. University A is located in an area with a high proportion of minority residents, and therefore has a high share of both minority students and minority academics. University B in contrast is in a low-minority area, and its composition reflects this. In our model, any selection-on-unobservables of either staff or students that is driven by these differences across geographical areas will be controlled for by the university fixed effects, and so this variation does not contribute to identifying the effect of minority staff on student outcomes.

We next assess the extent of identifying variation, and threats to the credibility of this identifying assumption.

4.1 Residual Variation

One typical worry is whether there is enough variation in proportion of minority academics between cohorts, subjects and the universities. As we also control for several department level characteristics as well as university cluster-subject group fixed effects, we might be controlling for most of the variation leaving little variation to exploit. In order to check whether this is the case, we follow

Blanden *et al.* (2016) and first check the raw variation and how much variation is left when we control for cohort, department, and university fixed effects as well as department controls and university cluster - subject group fixed effects. Table 2 shows when weighted by student numbers, the mean share of racial minority academics in UK universities is 13.09% with a standard deviation of 0.1029. When we control for cohort, university, subject, university cluster-subject group fixed effects as well as department level characteristics, we can only explain 40% of the variation in the minority academic share. This shows that even after controlling for several factors, one can estimate the effect of exposure to minority instructors on students. Similarly, when we look at the shares of Black, South Asian and Other racial minority academics, we find that we can explain less than one-third of the variation when we control for department level characteristics as well as different levels of fixed effects. This reassures that there is still enough variation to exploit.

4.2 Threats to Identification

Identification is threatened by endogenous selection: If, for example, certain groups of students have strong preferences for some group of universities, subjects, or university-subject combinations that, within choice sets and conditional on other observable characteristics, are correlated with the share of ethnic minority staff. First, in order to understand whether students' exposure to minority academics can be predicted by their observable characteristics, in Table 3, we regress exposure to minority academics (measured at university-subject-year level) against several student characteristics, as shown in equation 2.

$$PMin_{sjt} = \alpha_1 \mathbf{X}_i + \alpha_2 \mathbf{D}_{sjt} + \alpha_3 \delta_s + \alpha_4 \theta_j + \alpha_5 \tau_t + \alpha_6 \lambda_g \times \psi_c + \alpha_7 \mathbf{Q}_i + \mu_{isjt} \tag{2}$$

The table shows few individual characteristics have a weakly significant association (coefficient α_1) with the race of academic staff, exceptions being that High SES students have lower exposure to Minority staff, predominantly driven by the association with South Asian staff; and those with BTEC vocational qualifications are exposed to fewer Other racial minority staff. None of p-values for joint significance of this vector of personal characteristics $\mathbf{X}_i$ is statistically significant, and taking the individual signs and coefficients at face-value there is no indication of any systematically positive or negative selection. For example, arriving with Foundation degrees and with BTECs are both typically markers of negative educational selection in a UK HE context, yet these variables

have opposite-signed coefficients; while being high SES or a first generation student are markers of positive and negative socio-economic selection respectively, yet (except for Black staff, where both are trivially different from zero) these have the same sign coefficients. However, to account for any possible deviations from balance within choice sets and conditional on our fixed effects, we do control for all these observable student characteristics in our main specifications.

In addition to presenting evidence on overall selection on observables, we present evidence on whether White-minority gaps in student characteristics within departments are correlated with the proportion of minority academics. We follow Fairlie *et al.* (2014) and look at several demographic characteristics as well as students' entry tariff scores. Here, the important point is to examine variables that are highly correlated with the outcome variables. If we find that minority students are significantly different than White students in courses where there are higher proportion of minority academics, then the results that we find would be biased. If we find positive (negative) selection, the effect of minority academics on minority students would be under(over)estimated.

In Table 4, we present evidence on whether the share of minority academics predicts racial differences in student characteristics. In order to create this table, first we calculate minority-specific predetermined student characteristics (i.e. calculating the university-department-year specific average tariff score, proportion holding a BTEC, who are full-time etc, among White students, among minority students, and among each minority group, $\overline{X}_{cjt\Gamma}$). As shown in equation (3), we regress these outcomes against the share of minority instructors they are exposed to ($PMin_{cjt}$), a dummy for the minority group (Γ), and the interaction between the two ($\Gamma \times PMin_{cjt}$), along with other controls and fixed-effects. We report the coefficient, α_3 in the equation, its standard error and p-value. Then, we do this separately by students' racial group for White versus Black, White versus South Asian, and White versus Other racial minority comparisons.

$$\overline{X}_{cjt\Gamma} = \alpha_0 + \alpha_1\Gamma_\Gamma + \alpha_2 PMin_{cjt} + \alpha_3\Gamma_\Gamma \times PMin_{cjt} + \alpha_4\mathbf{D}_{cjt} + \alpha_5\delta_s + \alpha_6\theta_j + \alpha_7\tau_t + \alpha_8\lambda_g \times \psi_c + \epsilon_i \quad (3)$$

We first look at entry test scores and type of qualification that the students arrive at university with. Minority students overall, Black students, and South Asian students do not differ from White students in terms of their association between entry tariff scores and type of qualification and the

share of minority instructors.

We then look at the differences by personal characteristics. Namely, we look at their gender, SES, whether they are the first in their family to go to university, whether they are coming from a neighborhood where HE participation is low and whether they are classified as a mature student. The results show no differential White-minority associations with the share of ethnic minority staff. There is some marginally significant (at the 10% level) evidence that increasing the share of ethnic minority staff reduces the share of Black and Other ethnic students who are male. There is also evidence from the table that a higher share of ethnic minority staff is associated with a lower prevalence of "advantaged" ethnic minority students relative to White students, as measured by students coming from high SES backgrounds, or *not* being a first generation university student. This association comes principally through Other ethnicity students and to a lesser extent South Asian, with no significant association for Black students.

More advantaged students tend to perform better in university and in the labor market, other things equal. Therefore, if we relied purely on quasi-random assignment for our initial analysis of differential effects of minority staff on White versus minority students, we may expect a negative bias to our estimated relative impact on minority ethnic students. We therefore include student SES and first-generation status in our set of controls for all our main specifications. For our in-depth analysis, we focus on the differential impacts of minority staff on Black and South Asian students only, for whom we have determined there is no differential assignment to minority ethnic staff.[16]

These checks cannot rule out the possibility that some students have strong preferences for some university - degree programs which might result in them seeking out (or avoiding) and being more (or less) exposed to minority academics, even within their choice set. If they also exert more effort once at the university, they might have better academic as well as labor market outcomes due to this effort, biasing our estimates of the impact of minority academics. However, given the few significant associations of (differences in) observable student characteristics with minority staff; and the institutional setting requiring any such students correctly to forecast *changes* in minority staffing a year ahead, this scenario seems unlikely.

[16]The diversity of ethnicities within the Other category, for both staff and students, also means that student and staff "matched" according to this broad category are less likely to identify with the same ethnicity in practice than those matched as Black or South Asian. This in turn makes it inadvisable to draw strong interpretations and implications from analyzing treatment effects for these matched groups.

5 Results

5.1 Effects of Minority Academics

In this section, we present how exposure to minority instructors impacts White and minority students' academic and labor market outcomes.

In Table 5, we present the results on academic outcomes. White students are shown to benefit from exposure to more minority staff: A 10% increase in students' exposure to minority academics (approximately 1 standard deviation - see Table 2) increases White students' likelihood of achieving a first class honors degree by 0.5 percentage point. However minority students do not see any improvements from this exposure. The interaction term of minority student and proportion of minority academics is negative and significant leading to a negative and significant treatment effect of minority academics on minority students. There are beneficially-signed but insignificant treatment effects on getting a Good Degree (positive) and on dropping out (negative) for both White and minority students.

The absence of a beneficial effect for minority students contrasts with previous literature (Fairlie *et al.*, 2014; Lusher *et al.*, 2018) showing that students see their teachers and instructors as role models and having a teacher or an instructor from one's own racial group increases their academic outcomes. These null effects on the minority students could be attributed to our measure of exposure including mere 'visibility' of or any out-of-classroom interactions with minority staff within the department . Previous studies examine the effects of direct exposure within a classroom, a stronger form of interaction which may be necessary to generate the benefits they identify.

In Table 6, we present the results on post-graduation outcomes. We find no effect of being exposed to more minority academics on being in employment for White students, but conditional on being in employment, White students are more likely to hold a graduate level job and high SOC job. Minority staff also reduce White students' progression into graduate-level study (Master or PhD). We find opposite effects for minority students. Exposure to higher levels of minority academics reduces their likelihood of being in employment, and conditional on that, of being in high SOC employment. The effect size in employment is quite large, 13.5ppt which corresponds to 20% of the mean. However, minority students' exposure to minority academics *increases* their likelihood to study for another qualification by 6.9ppt and for a graduate degree by 6.6ppt. These effect sizes correspond to 31 and 53% of the mean. These are large beneficial effects, but this

accounts for only half of the negative impact on employment probability. While this effect on study behavior most likely causes negative selection into the employed sample, even if every Minority student diverted into further study was displaced from high SOC employment, this would not be sufficient to explain the negative impact on that outcome. This means that Minority students exposed to more ethnic minority staff are still more likely to be unemployed or out of the labor force.

These results show that exposure to minority academics provides better and worse outcomes both for White and minority students, but in different contexts. White students who are exposed to more minority academics have better academic and employment outcomes and slightly lower propensity for further (graduate level) study. Minority students' undergraduate outcomes are unaffected, but propensity to progress to a graduate degree is increased. The partial shift of minority students towards further study suggests they may see minority academics in their departments as their *role models*. In the UK, a masters degree is generally required to gain admission for PhD study. If the positive effects of exposure on the likelihood of studying for a graduate degree also increase students' likelihood of continuing to study for a PhD degree, then this might result in increasing diversity in academia. Current research shows that academia is not as diverse as the population of the UK (Advani *et al.*, 2020). Exposure to minority academics might be one of the possible ways to increase diversity in academia. Since evidence shows that UK labor market rewards a postgraduate degree (Lindley & Machin, 2016), we would also expect those minority students who gain admission to study for a graduate degree to go on to have better employment outcomes than otherwise, stemming from the skills gained during and signaling value of their postgraduate degree(s).[17]

5.2 Effects of Same-Race Academics

The effects of minority academics on students might vary by the students' and academics' own race. If students only see academics from their own race as role models, they might not benefit from having academics from other racial minority backgrounds. At the same time, students from different racial groups might have different stereotypes. For example, a Black student might not see a South Asian academic as a role model because they might believe that South Asian academics

[17]The data does not allow us to follow the graduates into their postgraduate years. As there is no longitudinal data, we cannot analyze what the graduates do after they finish their postgraduate study.

are more represented in their field (for example in STEM fields). Previous literature shows that students are generally affected from stereotype threat, being at the risk of conforming a negative stereotype relating to one's own identity (Steele & Aronson, 1995) and this threat affects their academic outcomes (Good *et al.*, 2003; Dee, 2014). In order to understand these mechanisms, we run additional set of regressions to understand how exposure to minority academics from one's own racial group and from other minority racial groups affect students' academic, employment, and study outcomes as well as their perceptions of the usefulness of HE.

We first study the academic outcomes. The results in Table 7 show that while Black students do not significantly benefit from exposure to Black academics, South Asian students are more likely to achieve a first class honors degree when they are exposed to academics from their own race group. On average, an increase of 10% in South Asian students' exposure to South Asian academics results in 1.09ppt increase in their likelihood of achieving a first class honors degree, and 1.42ppt increase in likelihood of achieving a good degree.

While the results on academic outcomes suggest that Black students do not benefit from exposure to same race instructors, there might be different effects on the labor market outcomes because while the students might not increase their effort in the university as a result of having role models, they might increase their job market aspirations. Academics from one's own racial group might also be useful in giving advice to students to be successful in the labor market or they might encourage students to pursue postgraduate study. The results in Table 8 show that Black students who are exposed to more Black academics are significantly less likely to be in employment. When we study South Asian students, we only find some weakly significant negative effect on exposure to South Asian academics, on their likelihood of holding a high SOC job.

Yet, the results in Table 8 show that both Black and South Asian students who are exposed to academics from their own races are more likely to study for a graduate degree upon graduation. The result for Black students and staff is particularly important, since Advani *et al.* (2020) show that Black graduates are less likely to go into PhD study than other ethnicities, and there is an even lower proportion of Black academics across UK universities. As Black academics are underrepresented in academia and Black graduates have worse labor market outcomes than others, this increase in the likelihood of studying for a graduate degree might improve these graduates' labor market outcomes as well as their likelihood of studying for a PhD.

6 Robustness Checks

We run several robustness checks to see if the results hold for different levels of clustering, a different measure of representation, and then for different sub-samples. Here, we focus on the effect of all minority instructors on White students and on all minority students, and of same-race instructors on Black and South Asian studentsWe first check the results by clustering the standard errors at different levels. The standard errors in the main specification are clustered at subject level. In Appendix Table A3, we cluster the standard errors at university, cohort and cohort-department level. The clustering specification is shown to affect the significance of some specific coefficients. For example, the beneficial effect of same race staff on South Asian students academic performance loses significance when clustering at the University level; and the positive coefficient of minority staff on minority students' attainment of a good degree turns significant with clustering by year or cohort-department. However, the conclusions that would be drawn from this paper from any of these choices would be broadly the same: Benefits of exposure to minority staff for the academic and labour market outcomes of White students; no benefits to these outcomes from same-race representation for Black students; but benefits to same-race representation for both Black and South Asian students' progression into graduate study.

We then calculate a different measure of exposure to minority academics. We restrict the sample to those academics who are student facing (instructors from this point on). The results in Appendix Table A4 show that all the main results hold. We then restrict the sample to students who are studying full-time as part-time students might have different unobservable characteristics than those whose main activity is university. Appendix Table A5 shows that main results hold, and in addition that minority students are less likely to dropout of their study when they are exposed to more minority academics. The impact of same-race staff on Black students' progression to graduate study is also strengthened.

Lastly, we run the main analysis separately for subject groups. we separate the subjects into 5 groups: i) Allied to Health Sciences, ii) STEM, iii) Social Sciences and Business, iv) Humanities and v) Arts, Education and Others. In Appendix Table A6, we present the results separately for each subject group and for each race. Confidence intervals are sometimes large, where there is little identifying variation in minority staff share within a subject area, so we must be cautious about interpreting differences between the fields.

Some important distinctions apparent in this table include that: Academic and job attribute benefits of exposure to minority staff for White students are largest in STEM, and smallest in Arts, Education and Others (AEO). For Black students, the negative impacts of same-race representation on employment and positive effect on graduate study is predominantly driven by Social Sciences and AEO graduates. For South Asian students, it is instead STEM graduates where representation reduces employment but increases study.

7 Conclusion

Increasing ethnic minority representation among academic staff is a measure, within the control of universities, that could plausibly help reduce the major and persistent disparities in academic and labor market outcomes experienced by ethnic minority students, relative to White. Using administrative data on the universe of Higher Education students and academic staff in the UK, linked with survey data on the post-graduation outcomes of students, we estimate the impact of academic staff ethnicity on the educational and, for the first time to our knowledge, labor market outcomes of students of matching and other ethnicities. We control for several dimensions of fixed effects across subjects, universities and cohorts, note the institutional details of the UK system that make additional selection biases (conditional on these fixed-effects) unlikely in theory, and show tests of balancing and differential selection by students of different ethnicities that indicate any such biases will be minimal in practice.

Our results suggest that increasing ethnic minority representation among academic staff is beneficial to the academic outcomes of the White majority group. This may be welcomed as evidence that increasing diversity poses no threat to the currently advantaged group, so there is no political barrier to doing so from students' perspectives. However increasing ethnic minority representation does not reduce, and may even widen, ethnic gaps in some labor market outcomes. Exposure to same-race academics increases South Asian students' likelihood of achieving a first class honors degree and a good degree outcome, but we find no effect of own-race representation on Black students.

We do find beneficial effects of minority or same-race representation for Black and South Asian students for progression to graduate study. This result suggest that the main mechanism through which same-race representation supports Black students is through providing a domain-specific

role model and advice or guidance. If governments and the universities would like to increase the diversity of graduate students and researchers in academia, increasing representation among academics might be a possible policy. Literature shows that diversity also improves innovation of the firms. If the students who went on to study for a further degree end up in R&D departments of the firms (Parrotta *et al.*, 2014), representation among academics might also affect innovation and development in non-academic settings.

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Figures

Figure 1: Proportion of Minority Academics by University-Department-Year - Unweighted

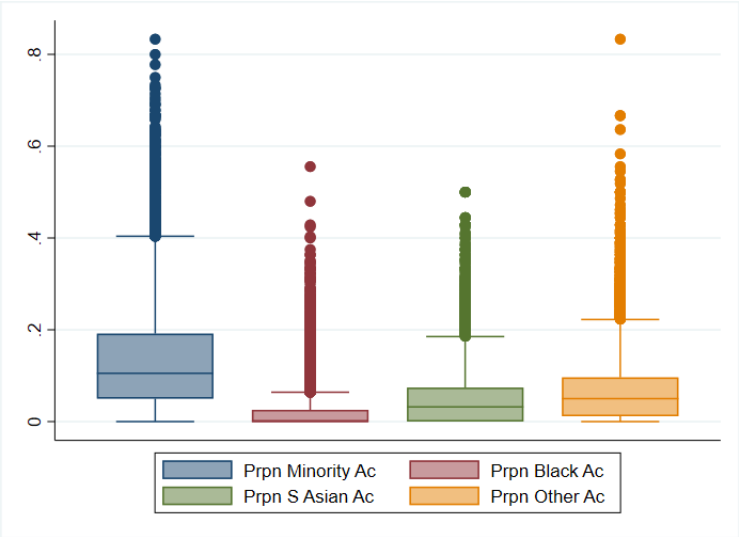
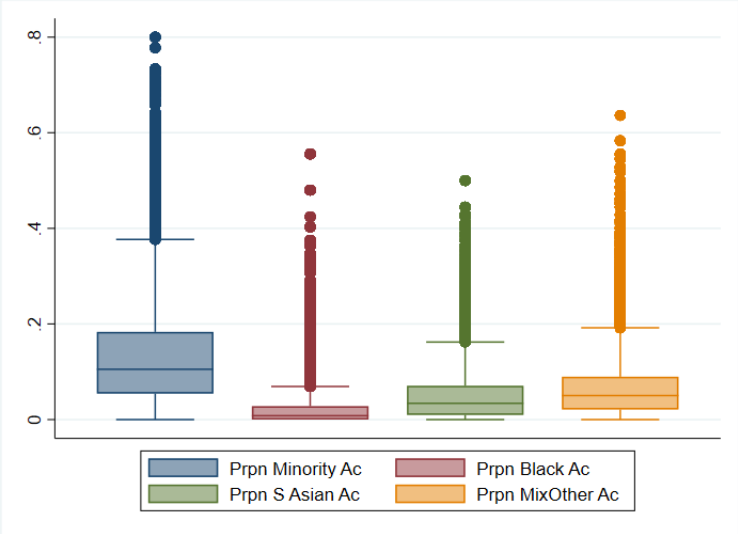
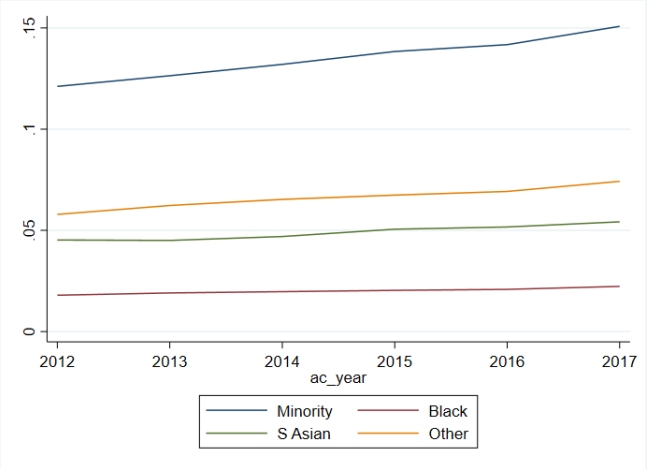


Figure 2: Proportion of Minority Academics by University-Department-Year - Weighted by Student Numbers



Notes: Source: HESA Staff and Student Records. The upper and lower hinges show 75th and 25th percentiles while upper and lower lines show upper and lower adjacent values. The line in the box shows the mean while the markers outside of the adjacent lines are outliers.

Figure 3: Variation over Time in Proportion of Minority Academics - Unweighted



Tables

Table 1: Descriptive Statistics: Student Characteristics and Outcomes

	All	White	Black	S Asian	Other
Personal Characteristics					
Female	0.5421	0.5482	0.5632	0.4961	0.5410
High SES	0.6678	0.6959	0.6238	0.4775	0.6199
State School	0.9082	0.9029	0.9676	0.9316	0.8979
Mature	0.1976	0.1962	0.2745	0.1654	0.1924
FT Student	0.8664	0.8704	0.8534	0.8398	0.8671
Previous Outcomes					
Tariff	116.8372	117.7485	107.6110	113.0931	116.7046
BTEC	0.1140	0.1003	0.2657	0.1551	0.1287
Tariff MIssing	0.2806	0.2630	0.4204	0.2935	0.2903
Academic Outcomes					
First	0.2207	0.2345	0.1038	0.1674	0.1957
Good	0.7558	0.7783	0.5720	0.6589	0.7267
Dropout	0.1026	0.0956	0.1645	0.1189	0.1189
N (Admin)	2,398,025	1,851,875	124,500	242,910	137,685
Post-Graduation Outcomes					
Employed	0.6714	0.6807	0.6674	0.6329	0.6267
Grad Job	0.3904	0.3966	0.3542	0.3820	0.3533
High SOC	0.6527	0.6539	0.6044	0.6628	0.6497
Any Study	0.2203	0.2183	0.2062	0.2278	0.2322
Grad Study	0.1265	0.1250	0.1245	0.1191	0.1472
N (Survey)	727,230	581,545	29,555	71,410	37,870

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. First and Good are conditional on not dropping out and Graduate Job and High SOC are conditional on being in full-time employment.

Table 2: Variation in Exposure to Minority Staff - Weighted by Student Numbers by University-Department-Year

Panel A: Share of Minority Academic Staff

	Mean	SD	Min	Max	N (Students)
Weighted Proportion	0.1301	0.1029	0.0000	0.8000	1,017,330
Net of Year FE	0.0000	0.1027			
Net of University FE	0.0000	0.0899			
Net of Department FE	0.0000	0.0627			
Net of Department Char.	0.0000	0.0616			
Net of Cluster x Subject FE	0.0000	0.0615			

Panel B: Share of Black Academic Staff

	Mean	SD	Min	Max	N (Students)
Weighted Proportion	0.0203	0.0332	0.0000	0.5556	1,017,330
Net of Year FE	0.0000	0.0331			
Net of University FE	0.0000	0.0288			
Net of Department FE	0.0000	0.0263			
Net of Department Char.	0.0000	0.0261			
Net of Cluster x Subject FE	0.0000	0.0260			

Panel C: Share of South Asian Academic Staff

	Mean	SD	Min	Max	N (Students)
Weighted Proportion	0.0471	0.0492	0.0000	0.5000	1,017,330
Net of Year FE	0.0000	0.0492			
Net of University FE	0.0000	0.0447			
Net of Department FE	0.0000	0.0345			
Net of Department Char.	0.0000	0.0343			
Net of Cluster x Subject FE	0.0000	0.0342			

Panel D: Share of Other - Mixed Minority Academic Staff

	Mean	SD	Min	Max	N (Students)
Weighted Proportion	0.0627	0.0578	0.0000	0.6364	1,017,330
Net of Year FE	0.0000	0.0577			
Net of University FE	0.0000	0.0514			
Net of Department FE	0.0000	0.0416			
Net of Department Char.	0.0000	0.0412			
Net of Cluster x Subject FE	0.0000	0.0410			

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Net of rows are cumulative. Department characteristics refers to department level controls such as proportion of female academics, proportion of academics that are on teaching or teaching and research contracts, proportion of academics that are reader or above, proportion of full-time academics, and proportion of academics on permanent contract.

Table 3: Selection into Departments with Minority Staff by Observable Student Characteristics

	(1) Minority	(2) Black	(3) S Asian	(4) Other
Continuous Tariff	-0.005	-0.000	-0.002	-0.003
	(0.003)	(0.001)	(0.002)	(0.002)
Tariff Missing	-0.592	-0.008	-0.216	-0.369
	(0.364)	(0.142)	(0.177)	(0.234)
Has IB	0.032	0.085	-0.040	-0.012
	(0.186)	(0.091)	(0.078)	(0.105)
Has BTec	-0.115	0.075	-0.030	-0.160**
	(0.137)	(0.053)	(0.064)	(0.065)
Foundation	0.171	-0.073	0.184	0.061
	(0.790)	(0.355)	(0.358)	(0.245)
Female	0.001	0.010	-0.026	0.017
	(0.033)	(0.016)	(0.019)	(0.022)
High SES (2-group)	-0.042*	0.004	-0.031**	-0.015
	(0.024)	(0.011)	(0.014)	(0.016)
First Generation Student	-0.026	-0.000	-0.011	-0.014
	(0.020)	(0.008)	(0.013)	(0.016)
Low HE Participation Area	0.007	-0.002	0.003	0.006
	(0.023)	(0.008)	(0.012)	(0.014)
Mature Student	0.071	0.029	0.045	-0.002
	(0.070)	(0.022)	(0.041)	(0.031)
p-value for joint sig	0.137	0.123	0.137	0.514
Observations	510,935	510,935	510,935	510,935

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Controls include department level controls and university, cohort, subject as well as cluster × subject group fixed effects. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table 4: Association of Minority Instructors with Ethnic Differences in Student Characteristics

	Tariff	Tariff M	BTEC	Female	High SES	First Gen	LPA	Mature
Ethnic Minority vs White								
b	-0.833	0.015	0.037	0.078	-0.145	0.180	0.023	-0.002
se	3.797	0.034	0.033	0.051	0.036	0.049	0.039	0.027
p-value	0.828	0.665	0.264	0.132	0.000	0.001	0.558	0.944
Separately								
Black vs White								
b	-2.368	0.060	-0.011	0.123	-0.034	0.072	0.094	0.004
se	4.729	0.043	0.059	0.067	0.050	0.066	0.057	0.032
p-value	0.619	0.167	0.848	0.074	0.500	0.285	0.104	0.905
S Asian vs White								
b	5.188	-0.037	0.031	0.047	-0.070	0.118	-0.020	0.010
se	5.532	0.050	0.034	0.062	0.043	0.049	0.050	0.042
p-value	0.354	0.461	0.373	0.448	0.115	0.022	0.686	0.803
Other vs White								
b	-9.203	0.090	0.004	0.099	-0.233	0.175	0.045	0.019
se	4.527	0.042	0.029	0.049	0.035	0.035	0.040	0.027
p-value	0.049	0.040	0.900	0.052	0.000	0.000	0.271	0.482

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. b, se and p-value indicate the coefficient, standard errors and p-value associated with α_3 of equation (3). Controls include department level controls and university, cohort, subject as well as cluster $\times$ subject group fixed effects. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table 5: Impact of Minority Staff Share on Students' Academic Outcomes

	(1) First	(2) Good	(3) Dropout
Prpn Minority Ac	0.049**	0.039	-0.013
	(0.024)	(0.026)	(0.013)
Minority	-0.083***	-0.102***	0.005
	(0.005)	(0.007)	(0.005)
Minority × Prpn Minority Ac	-0.079***	0.008	-0.007
	(0.019)	(0.029)	(0.020)
TE on Minorities	-0.029	0.047	-0.020
	(0.026)	(0.036)	(0.019)
Observations	772,665	772,665	933,935

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Controls include gender, tariff, type of qualification, socio-economic status, POLAR Q1, 2 & 3, being a first generation university student, and qualification subject, university, cohort, subject as well as cluster × subject group fixed effects. First and Good are conditional on graduating. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table 6: Impact of Minority Staff Share on Graduates' Post-Graduation Outcomes

		Cond. on Employment		Study	
	(1)	(2)	(3)	(4)	(5)
	Employed	Grad Job	High SOC	Any Study	Grad Study
Prpn Minority Ac	0.023	0.096***	0.057*	-0.025	-0.027**
	(0.028)	(0.031)	(0.032)	(0.026)	(0.013)
Minority	-0.034***	-0.006	-0.002	0.007	0.008
	(0.011)	(0.010)	(0.010)	(0.009)	(0.006)
Minority × Prpn Minority Ac	-0.158***	-0.156***	-0.223***	0.094**	0.093***
	(0.043)	(0.047)	(0.060)	(0.036)	(0.022)
TE on Minorities	-0.135***	-0.060	-0.165***	0.069**	0.066***
	(0.042)	(0.050)	(0.060)	(0.035)	(0.021)
Observations	510,390	341,230	340,760	510,390	510,390

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Samples for Grad Job and High SoC are restricted to those in full-time employment. Controls include gender, socio-economic status, POLAR Q1, 2 & 3, being a first generation university student, and qualification subject, university, cohort, subject as well as cluster × subject group fixed effects. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table 7: Impact of Minority Staff Share on Students' Academic Outcomes by Staff and Student Race

	(1) First	(2) Good	(3) Dropout
Prpn Black Ac	0.062	0.144**	-0.088**
	(0.098)	(0.060)	(0.036)
Prpn S Asian AC	0.122***	0.046	0.005
	(0.033)	(0.045)	(0.020)
Black	-0.110***	-0.165***	0.012*
	(0.007)	(0.009)	(0.006)
S Asian	-0.098***	-0.115***	-0.002
	(0.007)	(0.008)	(0.007)
Black × Prpn Black Ac	-0.061	-0.199*	0.023
	(0.073)	(0.101)	(0.086)
S Asian × Prpn S Asian Ac	-0.001	0.095	-0.016
	(0.067)	(0.066)	(0.054)
TE on Blacks from Own-Race Representation	0.000	-0.055	-0.065
	(0.078)	(0.089)	(0.077)
TE on S Asians from Own-Race Representation	0.122**	0.141**	-0.011
	(0.048)	(0.071)	(0.050)
Observations	772,665	772,665	933,935

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Controls include gender, tariff, type of qualification, socio-economic status, POLAR Q1, 2 & 3, being a first generation university student, and qualification subject, university, cohort, subject as well as cluster × subject group fixed effects. First and Good are conditional on graduating. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table 8: Impact of Minority Staff Share on Graduates' Post-University Outcomes by Staff and Student Race

		Cond. on in Employment		Study	
	(1)	(2)	(3)	(4)	(5)
	Employed	Grad Job	High SOC	Any Study	Grad Study
Prpn Black Ac	0.030	0.185***	0.194**	-0.041	-0.050
	(0.067)	(0.062)	(0.081)	(0.057)	(0.034)
Prpn S Asian Ac	-0.013	0.124***	0.079	-0.008	0.012
	(0.044)	(0.041)	(0.050)	(0.039)	(0.028)
Black	-0.000	-0.015	-0.015	-0.010	0.008
	(0.016)	(0.018)	(0.017)	(0.013)	(0.010)
S Asian	-0.065***	0.001	-0.006	0.026**	0.006
	(0.010)	(0.010)	(0.013)	(0.011)	(0.007)
Black × Prpn Black Ac	-0.273***	-0.372**	-0.245	0.113	0.175***
	(0.084)	(0.163)	(0.157)	(0.084)	(0.061)
S Asian × Prpn S Asian Ac	-0.129	-0.188**	-0.250**	0.072	0.075
	(0.092)	(0.074)	(0.095)	(0.068)	(0.045)
TE on Blacks from Own-Race Representation	-0.242***	-0.187	-0.051	0.071	0.125**
	(0.082)	(0.160)	(0.128)	(0.074)	(0.056)
TE on S Asians from Own-Race Representation	-0.142	-0.064	-0.171*	0.064	0.088*
	(0.101)	(0.074)	(0.089)	(0.076)	(0.053)
Observations	510,390	341,230	340,760	510,390	510,390

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Samples for Grad Job and High SoC are restricted to those in full-time employment. Controls include gender, socio-economic status, POLAR Q1, 2 & 3, being a first generation university student, and qualification subject, university, cohort, subject as well as cluster × subject group fixed effects. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Appendix

Table A1: Descriptive Statistics - by University Clusters

		Cluster		
	All	High	Medium	Low
Minority Academics				
Ethnic Minority	0.13	0.14	0.13	0.12
Black	0.02	0.01	0.03	0.03
S Asian	0.05	0.05	0.05	0.04
Other	0.06	0.07	0.06	0.05
Students				
Ethnic Minority	0.21	0.18	0.23	0.24
Black	0.05	0.03	0.06	0.08
SE Asian	0.10	0.08	0.11	0.10
Other	0.06	0.06	0.05	0.06
Academic Outcomes				
First	0.22	0.25	0.20	0.18
Good	0.76	0.85	0.71	0.63
Dropout	0.10	0.06	0.12	0.16
Post-Graduation Outcomes				
Employed	0.67	0.60	0.71	0.72
Grad Job	0.39	0.40	0.39	0.33
High SOC	0.65	0.72	0.63	0.55
Any Study	0.22	0.28	0.19	0.17
Grad Study	0.13	0.17	0.10	0.07

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. For tariff groups, see Appendix Table B1.

Table A2: Descriptive Statistics - by Cost Centres' Proportion of Minority Academics

	All	Below Median	Above Median
Students			
Ethnic Minority	0.21	0.13	0.30
Black	0.05	0.03	0.06
SE Asian	0.10	0.06	0.16
Other	0.06	0.05	0.07
Academic Outcomes			
First	0.22	0.22	0.27
Good	0.76	0.77	0.78
Dropout	0.10	0.04	0.04
Post-Graduation Outcomes			
Employed	0.67	0.67	0.68
Grad Job	0.39	0.37	0.44
High SOC	0.65	0.62	0.72
Any Study	0.22	0.23	0.20
Grad Study	0.13	0.14	0.12

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records.

Table A3: Impact of Minority Staff share on Students' Outcomes by Clustering at Different Levels

Variable	White	Minority	Black	S Asian
Academic Outcomes				
First	0.073	-0.010	0.045	0.126
se-University	(0.026)***	(0.028)	(0.072)	(0.077)
se-Year	(0.015)***	(0.020)	(0.043)	(0.041)***
se-Cost-Year	(0.019)***	(0.017)	(0.052)	(0.036)***
Good	0.043	0.046	-0.034	0.143
se-University	(0.021)**	(0.036)	(0.103)	(0.109)
se-Year	(0.009)***	(0.013)***	(0.050)	(0.044)***
se-Cost-Year	(0.015)***	(0.022)**	(0.066)	(0.054)***
Dropout	-0.012	-0.023	-0.088	0.020
se-University	(0.015)	(0.020)	(0.063)	(0.035)
se-Year	(0.002)***	(0.015)	(0.030)***	(0.064)
se-Cost-Year	(0.012)	(0.020)	(0.070)	(0.044)
N		555,870		
Post-Graduation Outcomes				
Employed	0.028	-0.129	-0.256	-0.143
se-University	(0.023)	(0.030)***	(0.069)***	(0.070)**
se-Year	(0.015)*	(0.017)***	(0.060)***	(0.048)***
se-Cost-Year	(0.019)	(0.026)***	(0.086)***	(0.063)**
Grad Job	0.113	-0.044	-0.175	-0.063
se-University	(0.025)***	(0.030)	(0.124)	(0.081)
se-Year	(0.020)***	(0.015)***	(0.104)*	(0.039)
se-Cost-Year	(0.023)***	(0.029)	(0.121)	(0.059)
High SOC	0.085	-0.140	-0.024	-0.169
se-University	(0.029)***	(0.037)***	(0.109)	(0.074)**
se-Year	(0.023)***	(0.023)***	(0.087)	(0.036)***
se-Cost-Year	(0.023)***	(0.032)***	(0.118)	(0.058)***
Any Study	-0.027	0.064	0.081	0.065
se-University	(0.021)	(0.030)**	(0.073)	(0.069)
se-Year	(0.015)*	(0.013)***	(0.066)	(0.023)***
se-Cost-Year	(0.017)	(0.024)***	(0.072)	(0.050)
Grad Study	-0.026	0.063	0.133	0.088
se-University	(0.014)*	(0.019)***	(0.067)**	(0.041)**
se-Year	(0.011)**	(0.004)***	(0.060)**	(0.016)***
se-Cost-Year	(0.012)**	(0.015)***	(0.059)**	(0.034)***
N		555,870		

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Table presents coefficients and standard errors when the main regressions are run by clustering standard errors at university, year and cost center × year level. The first two columns show the impacts of minority academics on White and minority students while the last two columns show the impacts of Black academics on Black students and South Asian academics on South Asian students. Controls include gender, socio-economic status, POLAR Q1, 2 & 3, being a first generation university student and qualification subject, university, cohort, subject as well as cluster × subject group fixed effects.For academic outcomes, the regressions also control for tariff and type of qualification a student comes to university with. First and Good are conditional on graduating. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table A4: Impact of Minority Staff share on Students' Outcomes Using only Student Facing Instructors

Variable	White	Minority	Black	S Asian
Academic Outcomes				
First	0.066***	-0.008	0.053	0.119***
	(0.023)	(0.025)	(0.083)	(0.046)
Good	0.049**	0.036	-0.025	0.120*
	(0.025)	(0.033)	(0.093)	(0.066)
Dropout	-0.012	-0.012	-0.046	-0.011
	(0.013)	(0.018)	(0.079)	(0.046)
N		933,935		
Post-Graduation Outcomes				
Employed	0.026	-0.135***	-0.262***	-0.129
	(0.030)	(0.040)	(0.080)	(0.091)
Grad Job	0.105***	-0.056	-0.190	-0.063
	(0.030)	(0.046)	(0.163)	(0.074)
High SOC	0.086**	-0.145**	-0.048	-0.161*
	(0.036)	(0.059)	(0.133)	(0.087)
Any Study	-0.028	0.070**	0.088	0.052
	(0.027)	(0.035)	(0.073)	(0.069)
Grad Study	-0.026*	0.070***	0.133**	0.083*
	(0.014)	(0.023)	(0.057)	(0.045)
N		510,390		

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Table presents coefficients and standard errors when the main regressions are run by only including instructors that are student-facing. The first two columns show the impacts of minority academics on White and minority students while the last two columns show the impacts of Black academics on Black students and South Asian academics on South Asian students. Controls include gender, socio-economic status, POLAR Q1, 2 & 3, being a first generation university student and qualification subject, university, cohort, subject as well as cluster × subject group fixed effects.For academic outcomes, the regressions also control for tariff and type of qualification a student comes to university with. First and Good are conditional on graduating. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table A5: Impact of Minority Staff share on Students' Outcomes Using only Full-time Students

Variable	White	Minority	Black	S Asian
Academic Outcomes				
First	0.046*	-0.015	0.076	0.139**
	(0.026)	(0.028)	(0.081)	(0.062)
Good	0.035	0.042	-0.061	0.127*
	(0.028)	(0.039)	(0.095)	(0.076)
Dropout	-0.020	-0.038**	-0.007	0.003
	(0.014)	(0.017)	(0.061)	(0.049)
N		716,100		
Post-Graduation Outcomes				
Employed	0.037	-0.134***	-0.284***	-0.146
	(0.031)	(0.042)	(0.083)	(0.107)
Grad Job	0.097***	-0.027	-0.286*	-0.019
	(0.030)	(0.052)	(0.163)	(0.093)
High SOC	0.064*	-0.154**	-0.179	-0.204**
	(0.035)	(0.065)	(0.135)	(0.090)
Any Study	-0.025	0.065*	0.143*	0.068
	(0.029)	(0.036)	(0.083)	(0.091)
Grad Study	-0.023	0.058***	0.223***	0.079
	(0.015)	(0.020)	(0.065)	(0.060)
N		415,660		

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5. Table presents coefficients and standard errors when the main regressions are run when sample consists of only full-time students. The first two columns show the impacts of minority academics on White and minority students while the last two columns show the impacts of Black academics on Black students and South Asian academics on South Asian students. Controls include gender, socio-economic status, POLAR Q1, 2 & 3, being a first generation university student and qualification subject, university, cohort, subject as well as cluster × subject group fixed effects. For academic outcomes, the regressions also control for tariff and type of qualification a student comes to university with. First and Good are conditional on graduating. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table A6: Impact of Minority Staff share on Students' Outcomes by Subject Group

	Allied to Health				STEM				Social Sciences			
Variable	White	Minority	Black	S Asian	White	Minority	Black	S Asian	White	Minority	Black	S Asian
Academic Outcomes												
First	0.111	-0.078	0.123	-0.175*	0.134***	0.061	0.093	0.141	0.082	-0.028	-0.047	0.168**
	(0.081)	(0.051)	(0.144)	(0.097)	(0.040)	(0.050)	(0.157)	(0.086)	(0.050)	(0.037)	(0.135)	(0.070)
Good	0.042	0.071	0.591**	0.041	0.062*	0.071	-0.217*	0.166*	0.001	0.030	-0.172***	0.063
	(0.090)	(0.100)	(0.301)	(0.135)	(0.034)	(0.051)	(0.119)	(0.095)	(0.026)	(0.023)	(0.046)	(0.088)
Dropout	-0.027	-0.089**	-0.193	-0.098	-0.002	0.013	-0.037	-0.010	-0.008	-0.004	0.097	-0.033
	(0.041)	(0.039)	(0.181)	(0.091)	(0.014)	(0.023)	(0.142)	(0.071)	(0.014)	(0.031)	(0.074)	(0.090)
N	205,105				229,190				273.505			
Post-Graduation Outcomes												
Employed	0.092	0.188	-0.611***	0.317	-0.009	-0.211***	-0.076	-0.300***	0.035	-0.031	-0.231***	0.068
	(0.080)	(0.132)	(0.212)	(0.249)	(0.030)	(0.052)	(0.157)	(0.076)	(0.050)	(0.041)	(0.082)	(0.081)
Grad Job	0.131	0.094	0.016	0.116	0.194***	-0.037	-0.105	-0.085	0.087***	-0.039	-0.374**	0.002
	(0.080)	(0.140)	(0.183)	(0.278)	(0.041)	(0.049)	(0.267)	(0.084)	(0.031)	(0.051)	(0.182)	(0.082)
High SOC	0.019	-0.069	-0.414	0.138	0.134***	-0.105**	0.087	-0.129	0.138**	-0.077	-0.001	-0.118
	(0.068)	(0.074)	(0.280)	(0.217)	(0.044)	(0.043)	(0.233)	(0.080)	(0.054)	(0.075)	(0.174)	(0.156)
Any Study	-0.100	-0.195*	0.342	-0.220	0.009	0.154***	-0.011	0.217***	0.003	-0.000	0.060	-0.107*
	(0.098)	(0.116)	(0.212)	(0.239)	(0.019)	(0.052)	(0.208)	(0.052)	(0.050)	(0.030)	(0.071)	(0.060)
Grad Study	-0.033	-0.061	0.203	-0.091	-0.032	0.104**	-0.048	0.192***	-0.031*	-0.012	0.106**	-0.089
	(0.058)	(0.048)	(0.168)	(0.118)	(0.023)	(0.047)	(0.167)	(0.066)	(0.017)	(0.038)	(0.049)	(0.056)
N	93,660				127,890				146,975			

	Humanities				Art, Education and Others			
Variable	White	Minority	Black	S Asian	White	Minority	Black	S Asian
Academic Outcomes								
First	0.046	0.073	0.019	0.061	-0.033	-0.211***	-0.289**	-0.330
	(0.035)	(0.050)	(0.290)	(0.154)	(0.061)	(0.068)	(0.169)	(0.276)
Good	0.012	-0.008	-1.300***	0.386***	-0.018	-0.257***	-0.125	-0.485
	(0.024)	(0.035)	(0.445)	(0.144)	(0.030)	(0.063)	(0.105)	(0.694)
Dropout	-0.002	-0.064**	-0.468*	0.023	0.038***	0.057	0.353***	-0.239**
	(0.015)	(0.027)	(0.281)	(0.121)	(0.013)	(0.046)	(0.098)	(0.099)
N	109,620				116,515			
Post-Graduation Outcomes								
Employed	-0.062	-0.084**	-0.545	-0.785***	0.083*	0.122***	-0.458*	0.157
	(0.058)	(0.042)	(0.542)	(0.245)	(0.043)	(0.040)	(0.268)	(0.253)
Grad Job	0.004	0.075	-0.722	0.561	-0.112	-0.106	-0.204	0.883
	(0.048)	(0.096)	(1.008)	(0.344)	(0.098)	(0.067)	(0.370)	(0.586)
High SOC	-0.016	-0.010	1.915***	-0.312	0.008	-0.134	0.172	0.586
	(0.048)	(0.110)	(0.447)	(0.266)	(0.021)	(0.298)	(0.347)	(0.568)
Any Study	0.005	-0.036	0.911	0.259	-0.110***	-0.124***	0.285	0.113
	(0.033)	(0.044)	(0.724)	(0.207)	(0.029)	(0.029)	(0.182)	(0.384)
Grad Study	-0.007	-0.059**	0.276	0.008	-0.063***	-0.060*	0.345***	0.088
	(0.021)	(0.027)	(0.724)	(0.136)	(0.008)	(0.033)	(0.102)	(0.233)
N	73,330				68,530			

Notes: Source: Linked HESA Student Records - Destination of Leavers from Higher Education Survey and HESA Staff Records. Sample sizes are rounded to the nearest multiple of 5.Table presents coefficients and standard errors when the main regressions are run separately. The first two columns show the impacts of minority academics on White and minority students while the last two columns show the impacts of Black academics on Black students and South Asian academics on South Asian students. Main controls are included For academic outcomes, the regressions also control for tariff and type of qualification a student comes to university with. First and Good are conditional on graduating. Standard errors are clustered at subject level. Standard errors are in parentheses. * p <0.1, ** p <0.05, *** p <0.01

Table B1: University Clusters, from Boliver (2015).

Cluster 2 ('High status')	Cluster 3 ('Medium status')		Cluster 4 ('Low status')
University of Aberdeen	Abertay Dundee University	Keele University	Anglia Ruskin University
University of Bath	Aberystwyth University	Kingston University	Bishop Grosseteste University
University of Birmingham	Aston University	Leeds Beckett University	University College Birmingham
University of Bristol	Bangor University	University of Lincoln	University of Bolton
Cardiff University	Bath Spa University	Liverpool John Moores University	Buckinghamshire New University
University of Dundee	University of Bedfordshire	London South Bank University	University of Cumbria
Durham University	Birmingham City University	Manchester Metropolitan University	University of East London
University of East Anglia	Bournemouth University	Middlesex University	Edge Hill University
University of Edinburgh	University of Bradford	Newman University	Glyndwr University
University of Exeter	University of Brighton	University of Northampton	Leeds Trinity University
University of Glasgow	Brunel University London	Nottingham Trent University	Liverpool Hope University
Goldsmiths, University of London	Cantenbury Christ Church University	Northumbria University	London Metropolitan University
Heriot-Watt University	Cardiff Metropolitan University	Oxford Brookes University	University of Wales, Newport
Imperial College London	University of Central Lancashire	Plymouth University	University of St Mark and St John
University of Kent	University of Chester	University of Portsmouth	Solent University
King's College London	University of Chichester	Queen Margaret University	University Campus Suffolk
Lancaster University	City University of London	Robert Gordon University	University of Wales Trinity Saint David
University of Leeds	Coventry University	University of Roehampton	University of Wolverhampton
University of Leicester	De Montfort University	University of Salford	York St John University
University College London	University of Derby	Sheffield Hallam University	
LSE	Edinburgh Napier University	Staffordshire University	
Loughborough University	University of Essex	University of Stirling	
University of Manchester	Falmouth University	University of Sunderland	
Newcastle University	University of Glamorgan	Swansea University	
University of Nottingham	Glasgow Caledonian University	Teeeside University	
Queen Mary University of London	University of Gloucestershire	Ulster University	
Queen's University Belfast	University of Greenwich	University of West of England	
University of Reading	Harper Adams University	University of West London	
Royal Holloway, University of London	University of Hertfordshire	University of West of Scotland	
University of St Andrews	University of Highlands and Islands	University of Westminster	
SOAS, University of London	University of Huddersfield	University fof Winchester	
University of Sheffield	University of Hull	University of Worcester	
University of Southampton			
University of Strathclyde			
University of Surrey			
University of Sussex			
University of Warwick			
University of York			

Table B2: Subject Groups

Subject Group	Subject
Allied to Health	Nursing and Allied Health Professions
	Psychology & Behavioral Sciences
	Health & Community Studies
	Anatomy & Physiology
	Pharmacy & Pharmacology
	Sports Science & Leisure Studies
	Veterinary Science
STEM	Agriculture, Forestry & Food Science
	Earth, Marine & Environmental Sciences
	Biosciences
	Chemistry
	Physics
	General Engineering
	Chemical Engineering
	Mineral, Metallurgy & Materials Engineering
	Civil Engineering
	Electrical, Electronic & Computer Engineering
	Mechanical, Eero & Production Engineering
	IT, Systems Sciences & Computer Software Engineering
	Mathematics
	Architecture, Built Environment & Planning
Social Sciences	Geography & Environmental Studies
	Area Studies
	Archaeology
	Anthropology & Development Studies
	Politics & International Studies
	Economics & Econometrics
	Law
	Social Work & Social Policy
	Sociology
	Business & Management Studies
	Catering & Hospitality management
Humanities	Modern languages
	English Language & Literature
	History
	Classics
	Philosophy
	Theology & Religious Studies
Art, Education and Others	Art & design
	Music, Dance, Drama & Performing Arts
	Education
	Continuing Education